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FRIDAY, MAY 25, 1883.

*INTERNATIONAL BUREAU OF WEIGHTS
AND MEASURES.*

IN compliance with the requirements of the nineteenth article of the regulations, the international committee of weights and measures has issued its report for the year 1882, and of the present condition in the progress of its important work. It is the most satisfactory report so far made; and it shows every thing to be in such good order, and working so well, that the delivery of the international standards may be expected to be begun during next year. To the present time the progress has necessarily been slow, as the important questions of means and methods had to be carefully considered before adoption. Now, however, we see the methods settled, the means at hand, and the contracts let for the delivery of the bars for the international metres, and the ingots for the kilograms.

The report covers the operation of the calendar year 1882. During the year important advances were made in the instrumental outfit. The universal comparator, which was ordered in 1877, and was for four years in process of construction by Starke & Kammerer in Vienna, was received at Breteuil in November, and is now undergoing a thorough examination and testing of all its parts, previous to its use in determining the values of the new line metres.

A contract has been entered into, between the bureau and the *Société genevoise pour la construction d'instruments de physique et de mécanique*, for the delivery, by the latter, of a comparator for testing base bars, whether of line or end measure, of lengths up to and including four metres; the outfit of the comparator to include two four-metre line-standards, each subdivided into single metres by lines drawn on platinum-iridium plugs inserted at proper intervals. These standards are to be of wrought iron, T-shaped in cross-section. In addition to the subdivision into metres, one of these standards is to have two additional lines 0.051 metre within the four-metre lines (the

space so marked serving as a double-toise standard), and two lines 0.060 metre without the four-metre lines (this space serving as the standard for comparison of four-metre end-measures by the use of contact cylinders). The contract price for this apparatus, delivered and mounted, is 34,000 francs. It is to be delivered at Breteuil before the end of July of this year.

The balance for vacuum weighings was received, but certain defects in its construction required it to be returned to the maker for alteration. Unhappily the condition of his health has delayed the necessary work; and, as it did not seem probable that he would be able soon to give the matter his personal attention, the execution of the details of alteration has been intrusted to other hands, and it is expected that the balance will be in satisfactory working-order before the end of the present year. Under the care of M. Marek, the other balances have been placed in position; and every thing is in readiness for the weighings in air and for the hydrostatic weighings.

The Fizeau expansion apparatus has been so modified as to admit of experiments in vacuum, and the tests of the modified apparatus have been most satisfactory. From the observations for the expansion of the platinum-iridium tripod of the apparatus, data were obtained for ascertaining, more surely than ever heretofore, the index of refraction of air between 0° and 80° C.

The air-thermometer apparatus has been perfected; and it is hoped that the comparisons of thermometers, retarded by the illness of Dr. Pernet, will soon begin.

The contract for furnishing the bars for the metres, and the ingots for the kilograms, has been given to Messrs. Johnson, Matthey, & Co., of London. This house agrees to furnish thirty bars, X-shaped, and further specified as follows: the length to be 1.20 metres; the density, not less than 21.5; the alloy to be such, that, in 100 parts, there shall be not less than 89.75 nor more than 90.25 parts of platinum, and not less than 9.75 nor more than 10.25 of iridium, with a tolerance of 0.1 iron, 0.1 ruthenium, 0.15 rhodium and palladium,

and 0.02 gold and silver. The bars are to be of homogeneous metal, entirely soluble in *aqua regia*, and of uniform density. This density is to be ascertained from two specimens taken from the two ends of the bar. Before making the alloy, there shall be taken, from a mass of at least 20 kilograms, two specimens of each metal; and the same shall be done with the alloy before proceeding to make the bars or kilograms. These specimens will then be sent to a member of the international committee at Brussels, and to a member of the French section at Paris, respectively, for independent analysis; and the work shall not proceed until these specimens are examined and approved. The bars shall present no defects which will not disappear in the finishing; and this finishing shall not be undertaken until the rough bars have been submitted, examined, and accepted, provisionally, by the French section. Messrs. Johnson, Matthey, & Co., are left free to use their own judgment as to the best method of preparing the pure metal, of making the alloy, and of making the bars. If any bars are rejected, they shall be returned to the makers; and the French government shall not be held liable either for the labor expended or for the value of the metal.

Messrs. Johnson, Matthey, & Co., further agree to furnish forty ingots of the same metal for the construction of the international kilograms. Each piece is to weigh between 1.150 and 1.200 kilograms, and to be subject to the same conditions, regarding composition, alloy, and density, as the bars.

For this work the makers are to receive 2,000 francs per kilogram for the alloy accepted, 2,500 francs for work on each bar, and 150 francs for work on each kilogram. In part-payment, they are to take all unused alloy at the rate of 900 francs per kilogram; and the sample specimens sent to Brussels and Paris at the rate of 2,000 francs per kilogram.

Before undertaking the adjustment of the international standards, it was necessary to prepare authentic copies of the original prototypes. This delicate work was intrusted to two joint committees, composed of members of the inter-

national committee and of the French section, one having charge of the comparisons of length, and the other of those of weight. The comparisons were successfully made. The copies of the *mètre des archives* and of the *kilogramme des archives* are of platinum-iridium, fulfilling all the conditions above mentioned, as required for the new international standards.

On the 26th of April, 1882, there was held a meeting, at which were present the minister of commerce, the director of the international bureau, and five members of the international committee and French section. After a statement of the comparisons made, and results obtained, the type-metre and type-kilogram were, in the presence of the above-mentioned parties, formally delivered into the hands of M. Broch, the director of the international bureau, who, from that moment, was charged with the care, custody, and preservation, of these important articles. These types will serve as the standards for the international metres and kilograms; and the limit of error allowable in the marking and adjustment of the latter is fixed at ± 3 microns for the metre, and ± 0.2 milligram for the kilogram.

To hasten as much as possible the final adjustment of the international standards, it is ordered that the French section transmit each metre and kilogram as it is ready, without waiting for the preparation of the entire number. In this way the comparison and verification will be in execution by the international committee, while the tracing of the metres, and adjustment of the kilograms, are being done by the French section.

The construction and verification of the thermometers which are to accompany the standards will be the care of the international committee.

During 1882 the *personnel* of the international committee remained unchanged. The committee will, however, soon suffer a loss in the departure of one of its most able members, M. Marek, who leaves to accept a position in the Austrian bureau of weights and measures. The resignation of M. Marek was accepted, to take effect at the close of last year; but at

the urgent request of the committee, and by permission of the Austrian government, he remains a few months to attend to the printing of important papers, which will appear in the next volume of the *Travaux et mémoires* of the bureau, and to superintend the adjustment of the new universal comparator.

In the latter part of 1881 the kingdom of Roumania expressed a desire to subscribe to the regulations of the international commission, and is now numbered among the states represented in that body. The metric system is now used in all official transactions in Roumania; and on the 1st of January, 1884, its use will become compulsory throughout the kingdom.

RECENT EXPLORATIONS IN THE REGION OF THE GULF STREAM OFF THE EASTERN COAST OF THE UNITED STATES BY THE U. S. FISH-COMMISSION.¹

1. Introductory.

ALTHOUGH several extended surveys along the region of the Gulf Stream had been made by the officers of the U. S. coast-survey since 1844, no systematic dredging had been done along its course, north of Florida, until 1880. During the previous surveys, large numbers of bottom samples had been saved. Some of these were studied many years ago by Professor Bailey, and later by Mr. L. F. de Pourtales. Many of the Foraminifera and other microscopic forms have been described by them. A few small shells from the same source were described by Dr. A. A. Gould in 1862. These investigations gave a general idea of the nature of the materials of the bottom and the depth, but many errors existed in the earlier surveys in the determinations of temperature, and in many cases the recorded depths were unreliable. The extensive surveys made by the Blake, since 1880, have been conducted with much better apparatus and greater accuracy.

The real character of the fauna inhabiting the bottom beneath the Gulf Stream, off our coast, was completely unknown until 1880, when numerous and successful dredgings were made, first, by Mr. Alexander Agassiz, on the coast-survey steamer Blake (J. R. Bartlett, U.S.N., commanding), and, later in the season, by the U. S. fish-commission party, on the Fish Hawk. The Challenger, on her celebrated

voyage, made a line of dredgings from Bermuda toward New York; but, on approaching our coast, she turned northward, and went to Halifax. Her station nearest to our coast was about 160 miles off New York, in 1,240 fathoms. This is much farther off the coast than any of the fish-commission dredgings, and outside the Gulf Stream slope. The few dredgings made by the Challenger off Halifax were partly on the shallow fishing-banks (Le Have bank), and partly in the deep water of the Atlantic basin. By mere chance, therefore, the Challenger missed the discovery of the exceedingly rich and varied deep-water fauna that is now known to occupy the Gulf Stream slope all along our coast. In 1872 one haul was made by Messrs. S. I. Smith and O. Harger, on the Bache, in 430 fathoms, south of George's bank, on this slope; but it happened to be on a comparatively barren spot. In 1877 the U. S. fish-commission party dredged on the northward continuation of the slope, about 120 miles south of Halifax, in 90 and 190 fathoms; but the bottom was of barren gravel, and the results meagre and unsatisfactory. In that region the cold currents are rapid, and the slope of the bottom is exceedingly steep, making the dredging very difficult. In 1880 Mr. A. Agassiz, while on the Blake, made several lines of dredgings off our eastern coast, crossing the Gulf Stream slope. The most southern of these were off the Carolina coasts, and the most northern stations were just south of George's bank. These dredgings extended from shallow water to 1,632 fathoms. The Blake was furnished with excellent apparatus for sounding and dredging, temperature determinations, etc. The officers of the Blake secured by this exploration a large amount of reliable physical data; and Mr. Agassiz obtained very interesting collections, including large numbers of new forms of animal life, many of which have already been described in the bulletin of the Museum of comparative zoölogy.

Later in the season of 1880, the U. S. fish-commission dredging-party, under the direction of the writer, made its first expedition to the Gulf Stream slope in the steamer Fish Hawk (Lieut. Z. L. Tanner commanding). The region visited was about 75 to 80 miles south of Martha's Vineyard, in 65 to 192 fathoms. On Sept. 4, when this ground was first visited by us, a long day was spent in dredging and trawling, and with marvellous results. The bottom was found to be occupied by an exceedingly rich and abundant fauna, including great numbers of new and strange forms of

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